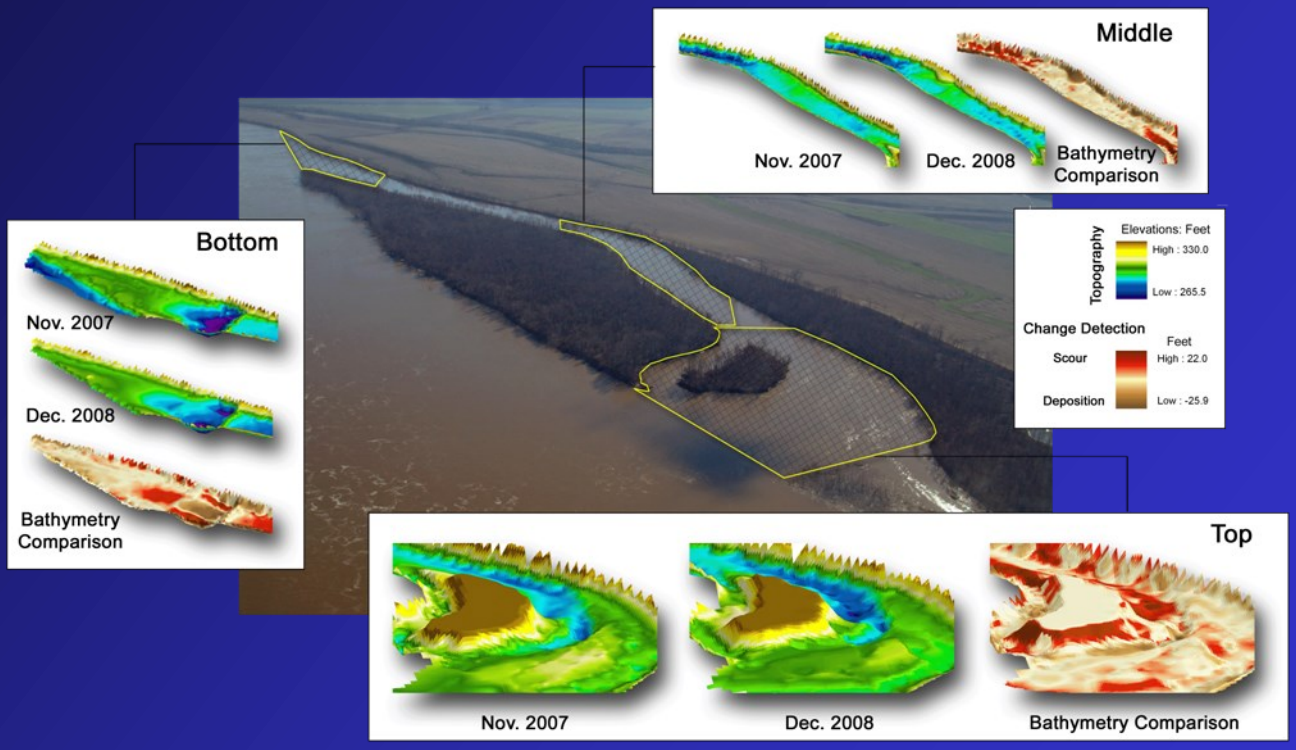
MDC Resource Science

Science Notes

Shallow Bathymetric Mapping of Buffalo Island Chute: Examining Change Over Time



Missouri Department of Conservation (MDC) 2009 VOLUME 4 NO. 13

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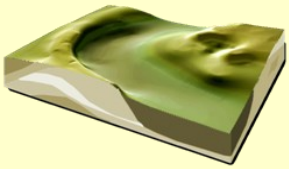

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SUMMARY

Buffalo Island Chute (side channel) is located along Middle Mississippi River (MMR), mile 24.5-26.3R. The river's morphology has been changed in large part because of channelization and maintenance of the 9-foot navigation channel. In 1796, 55 side channels were recorded in the MMR, but fewer than 30 exist today.

The goal of this project is to physically alter structures in the chute to improve water quality, diversify habitat, and improve fish community structure and resiliency. Fish, water quality, and elevation data are being collected to quantify the changes pre– and post-construction (see 2009 Volume 4 NO. 12).

Goal: To document physical morphology changes in Buffalo Island Chute to better understand post-construction biological changes.

We recorded elevations in the chute using several methods. Water depths were recorded using boat-mounted GPS depth sounders. Exposed sandbars were mapped with GPS units and laser levels. All measurements were adjusted to daily river elevations from Price Landing gage station. The elevation waypoints were interpolated into a surface or digital elevation model (DEM) with ArcMap's Spatial Analyst extension (Figure 1). The DEM was verified by examining the location of the estimated water lines as the river stage fell. Photo stations were used to compare elevations and water coverage simulated in ArcMap and ArcScene.

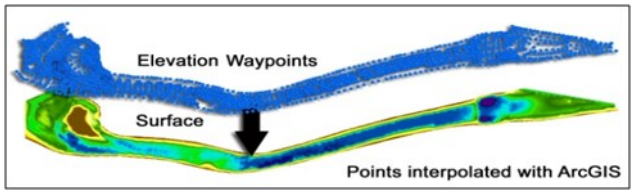

Figure 1. Using ArcMap's Spatial Analyst extension, way-points were interpolated into a surface raster (also known as a digital elevation model or DEM).

Although floodplain processes (erosion and deposition of sediments) have been drastically reduced outside channelized banks, they are still at work within the fortified main channel and existing side channels. After our initial mapping in November 2007, the Mississippi River was connected to Buffalo Island Chute multiple times. The flow of water during this period continued to change the side channel's morphology. To account for this change pre-construction, we mapped Buffalo Island Chute again in December 2008.

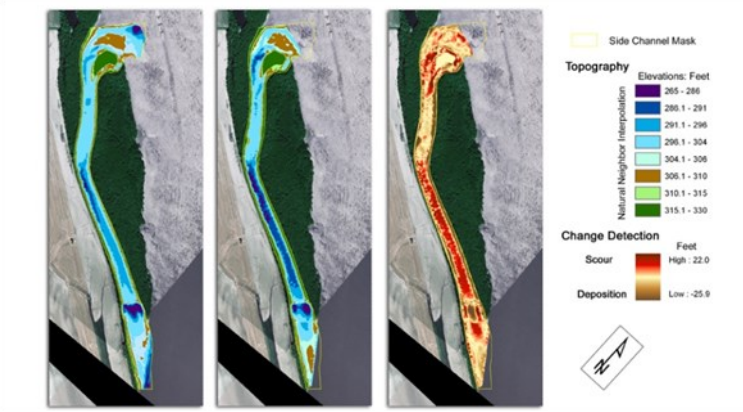

Figure 2. Changes in Buffalo Chute Morphology from 2007 to 2008.

Using Spatial Analyst, we subtracted the 2007 DEM from the 2008 DEM to see where sediment had been deposited and eroded. The result was another raster image indicating areas of change, confirming our field observations (see front cover and Figure 2).

- At the **top** of Buffalo Island Chute, flows eroded portions of the island front. Trees had fallen where the bank subsided. The shape of the sand bar in front of the island had changed. At the tail of the island high flows had scoured the channel bottom.
- In the **middle** of the chute sediments were evenly deposited until the flows hit the fortified (rip-rapped) bend. At this point, sediments were again scoured.
- At the **bottom** of the chute, sediment was eroded and deposited. The most significant deposition was immediately below the closing structure.

Management Implications: Using this methodology, changes in side channel morphology and habitat alterations after extreme hydrological events can be documented and aid interpretation of biological assessments of habitat rehabilitation projects on large rivers.

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Keywords: side channel, mapping, water depth, topography, elevation, habitat, survey, gradient